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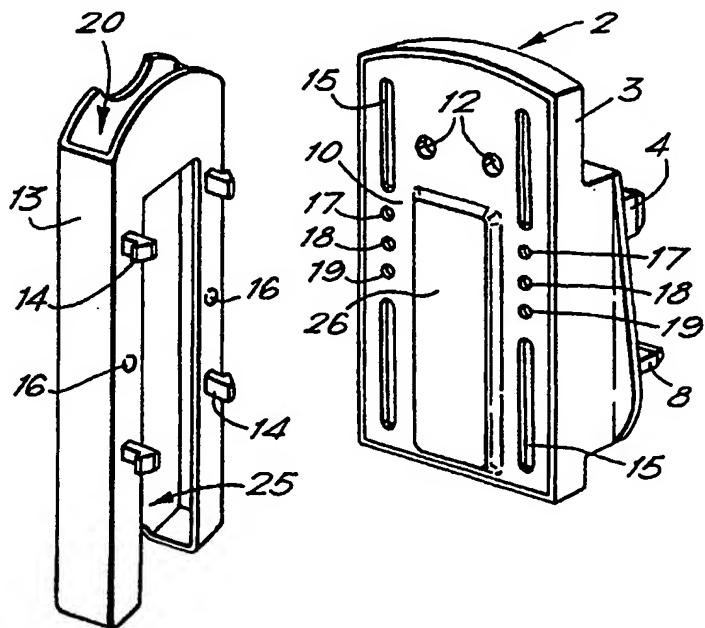
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(54) Title: EVAPORATOR



EVAPORATOR

This invention relates to evaporators, for example
5 electrically heated evaporators for use in air-freshening.

According to a first aspect of the invention there
is provided an evaporator comprising a body portion, a
heating means carried by the body portion, a holder
10 portion defining a space for containing a volatile
material and means for attaching the holder portion to
the body portion so that the holder portion is movable
relative to the heating means between at least two
stable positions, the positions allowing, in use,
15 respective, different, amounts of heat energy to be
conveyed to the space, whereby volatile material can be
volatilized at different rates.

According to a second aspect of the invention
there is provided an evaporator comprising heating
20 means, locating means for locating a container of
volatile material relative to the heating means so
that, in use, heat may be transferred from the heating
means to the container, and displacement means for
effecting relative displacement between the container
25 and the heating means.

For a better understanding of the invention and to
show how the same may be carried into effect, reference
will now be made, by way of example, to the
accompanying drawings, wherein:

30 Figure 1 shows a perspective view of an evaporator
according to one embodiment of the invention;

Figure 2 shows the evaporator of Figure 1
disassembled to show a cartridge holder;

35 Figure 3 shows a cross-sectional view taken on
line A-A of Figure 1;

Figure 4 shows a perspective view of a component

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part of the evaporator of Figure 1;

Figure 5 shows a perspective view of an air
freshener cartridge;

Figure 6 shows a perspective view of a component
5 part which may be used as an alternative to the part
shown in Figure 4;

Figure 7 shows a detail of Figure 6; and

Figure 8 shows a cross-sectional view of a
component part of an evaporator according to a second
10 embodiment of the invention.

Figure 1 shows a perspective view of an electric
evaporator 1 designed for use with electricity supply
points or sockets of the type used in the United
Kingdom and shown in its normal operating orientation.
15 Figure 2 shows the evaporator partially disassembled
and Figure 3 shows a cross-section through the
assembled evaporator. As is particularly shown in
Figure 3, the evaporator comprises three separately
moulded plastics components. The first component is a
20 plastics housing 3 from which projects a plastics
"earth" pin 4 integral with the housing 3. Two holes
in the housing below the pin 4 allow "live" and
"neutral" pins 8 to project from the housing, giving
the conventional 3-pin plug arrangement. The earth pin
25 4, upon insertion into a power point, causes the live
and neutral sockets to open whereupon all the plug pins
can be fully inserted.

Mounted inside the housing is a ceramic type
resistor 9 having electrical connection legs 6 (one of
30 which is covered by the other in Figure 3) and
supported by a mounting portion 7 carrying the live and
the neutral pins 8 between which the resistor is
electrically connected, as shown in Figure 4. The
mounting portion 7 is elongate and extends laterally
35 across the housing, being retained therein by four
clips, two of which are partially visible, and also

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shown dotted, in Figure 3. The resistor has an elongate box shape with its long axis running from top to bottom of the housing and centred between the live and neutral pins, the legs 6 of the resistor exiting
5 from the resistor body at its upper end.

The second plastics component of the evaporator is a cover-plate 10 which comprises two lower lugs 11 (one of which is shown in Figure 3), arranged to engage respective holes 27 in the bottom wall of the housing,
10 and two upper holes 12 arranged to receive respective hollow projections 28 from the inner surface of the housing, allowing screws to engage the projections 28 to secure the cover-plate to the housing, thus ensuring
that the live and neutral electrical terminals are
15 inaccessible.

When the cover-plate is so secured, the resistor lies directly behind and in, or substantially in, direct contact with a raised portion 26 of the cover-plate. The resulting combination form a plug plate or
20 body portion 2 as shown in Figure 2.

The third plastics component of the evaporator is a cartridge holder 13 which is arranged to be slidably engaged with the cover-plate 10 by means of four snap-in connectors 14 which are received by respective slots
25 15 in the cover-plate. Two hemi-spherical knobs 16 which protrude from the holder 13 can be located in any pair of three pairs of holes 17, 18, 19 when the holder is engaged with the housing, to provide three stable vertical spaced positions of the holder relative to the
30 plug-plate 2.

The holder has a hollow interior into which an air-freshener cartridge 19 (Figure 5) can be loaded through upper, open, end 20 of the holder. The cartridge comprises a thermoformed plastics tray 21
35 having a container portion 22 surrounded by a peripheral flange 23. The interior of the container

portion is filled during manufacture with a suitable volatile air-freshener material 29, for example a perfumed silica gel. The container portion is covered with a porous layer 30, for example of flexible plastics material, and the layer 30 is sealed by a removable covering, non-porous, layer 31, for example of aluminium foil, both layers being attached at their periphery to the surface of the flange by an adhesive. The non-porous layer 31 prevents the evaporation of the air-freshener prior to use but is intended to be peeled-off before insertion into the holder.

When the cartridge is fully inserted into the holder, the lower edge of its flange locates on interior ribs 33 and a greater part of the base 24 of the container portion is exposed through an opening 25 in the wall of the holder. This allows the exposed portion to be contacted by the raised portion 26 of the cover-plate when the loaded holder is engaged with the cover-plate.

When the evaporator is plugged into a power socket, current flows through the resistor 9 causing it to heat. This heat is conducted through the raised portion 26 of the cover plate to the base of the container portion 22 of the cartridge, resulting in the heating of the volatile air-freshener material. The amount of heat conducted to the material is such that it causes the air-freshener material to volatize, with the vapour being emitted through a generally s-shaped opening 32 in the front of the holder and through the top of the holder into the atmosphere. The amount of vapour given off increases as the transmitted heat energy increases.

The amount of heat energy transmitted to the air-freshener material can be varied by selecting different ones of the three stable vertical settings provided by the knobs 16 on the holder and the receiving holes 17,

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18 and 19 in the cover-plate. In the uppermost setting, with the knobs engaging the top set of holes, only about 70% of the vertical length of the base of the container portion is in contact with the heat 5 supplying raised portion. This percentage increases to about 85% in the middle setting and to almost 100% for the lowermost setting, with the transmitted heat energy increasing correspondingly. These three settings correspond therefore to low, medium and high air- 10 freshening settings, for example giving mean temperatures at the air-freshener material of about 49, 55 and 61°C.

If the slidable engagement of the cartridge holder 13 with the cover-plate 10 is formed to be a friction 15 fit so that a small friction-overcoming force is required to move the cartridge holder relative to the cover-plate, the knobs 16 and the holes 17, 18, 19 can be dispensed with yet still providing stable positions. This arrangement will allow the overlap of the base of 20 the container portion 22 with the heated raised portion 26 of the cover-plate to be continuously variable, the container portion thus being held stably in its selected location by friction.

The rating and location of the resistor is 25 selected to ensure a relatively uniform temperature distribution over the raised portion 26 of the cover plate, sufficient to volatize the air-freshener but low enough to prevent thermal damage occurring to either the raised portion itself or to the air freshener 30 container. In the preferred embodiment a resistor having a resistance value in the range 16 to 22K Ω , preferably 18 Ω , providing a temperature range of 42 to 69°C across the raised portion, proves suitable. A linear travel distance of 10 mm between the uppermost 35 (low) and lowermost (high) positions of the cartridge holder relative to the cover plate has been found to

vary the rate of volatization in grams/hour by a factor of approximately two, a suitable variation in the air freshening capacity of the unit.

Figure 6 shows an alternative form of internal construction for the evaporator shown in Figures 1 and 2. In this arrangement a resistor 35 is coupled directly to the rear surface of the raised portion 26 of the cover-plate 10 by means of a pair of clips 36 which project from that rear surface. The resistor 35 is oriented such that its longitudinal axis lies substantially at right angles to the longitudinal axis of the resistor 9 described with reference to Figures 3 and 4, i.e. transversely with respect to the direction of movement of the cartridge holder relative to the cover plate.

In a preferred embodiment the resistor 35 is further secured in place by means of an adhesive cement of good thermal conductivity, for example LOCTITE 406 cement, which is placed on that rear surface, between the clips 36, prior to the insertion of the resistor. In addition to further securing the resistor in position the cement has the effect of ensuring that heat is rapidly and uniformly conducted from the resistor to the adjacent portion of the cover-plate. Such use of a thermally conductive cement is believed to be novel in itself.

The live and neutral pins 8 are connected to the respective ends of the resistor by resistor connecting legs 37.

Figure 6 also shows a simplified view of the inside of the housing 3 which comprises receiving slots 38 through which the pins 8 project when the evaporator is assembled. Two clip arrangements are provided, each comprising clips 39 which are integral with the housing 3 and which project from each side of the associated slot 38 (one of which clip arrangements is shown in

more detail in Figure 7). Respective projections are provided on the rear surface of the cover-plate 10 (although these are not shown in Figure 6), arranged to lie behind the pins 8 so as to space the ends of the 5 pins apart from said rear surface and thus to allow the clips 38 to snap into place behind the enlarged end portions of the pins when the pins are fully inserted into respective ones of the slots 38. Thus the pins are held firmly in place when the evaporator is 10 assembled.

The arrangement of Figure 6 has the advantage that the heat applied to the raised portion of the cover-plate is more restrictively localised, in the direction of movement of the cartridge holder relative to the 15 cover-plate, than that applied by the arrangement of Figure 4. In consequence, the heat transfer rate and therefore the rate of vaporisation of the air-freshener material in the cartridge is more precisely dependent on the position of the cartridge holder relative to the 20 cover-plate. An appropriate resistor for use with the arrangement of Figure 6 is a normal carbon type resistor having a resistance value in the range 33 to 53 k Ω e.g. 43 k Ω .

It will be apparent that the above described 25 embodiments can be modified so as to be compatible with any type of power point. For example, Figure 8 shows the housing portion 3 of an evaporator suitable for use with a continental European, two pin, power point. The cover plate and cartridge holder designs would be 30 substantially the same as those described above with reference to the United Kingdom unit, whilst the live and neutral pins would be replaced with rounded, European style pins. Corresponding modifications can provide a further embodiment suitable for the North 35 American continent. The resistor value must of course be adjusted to suit the supply voltage in each case.

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It is contemplated that the above described evaporator can also be used to disseminate alternative types of volatile material such as insecticides and medicinal fragrances. The evaporator of the present

5 invention is also not limited to having an electrically powered heater, a suitable alternative heater being, for example, a flameproof chamber within the unit containing a flammable material which is ignited in order to commence volatization.

10 In a further modification, a rotary sliding movement replaces the linear movement and this may be achieved by a construction in which the slots 15 are arcuate and the connectors 14 are correspondingly arranged on an arc. The plug plate and cartridge

15 holder may also be generally circular in that case.

CLAIMS

1. An evaporator comprising a body portion, a heating means carried by the body portion, a holder portion defining a space for containing a volatile material and means for attaching the holder portion to the body portion so that the holder portion is movable relative to the heating means between at least two stable positions, the positions allowing, in use, respective, different amounts of heat energy to be conveyed to the space, whereby volatile material can be volatilized at different rates.
2. An evaporator according to claim 1 wherein the holder portion is movable relative to the body portion between at least three stable positions.
3. An evaporator according to claim 1 or 2 wherein the stable positions are determined by the interengaging of features of shape of the body portion and the holder portion.
4. An evaporator according to claim 3 wherein the interengaging is provided by the interlocking of a protrusion, or a recess, of one of the body portion and the holder portion with recesses, or protrusions as the case may be, of the other of the body portion and the holder portion.
5. An evaporator according to any one of the preceding claims wherein the attaching means is arranged slidably to attach the holding portion to a wall of the body portion, so that the holding portion can be slid between the stable positions.
6. An evaporator according to any one of the preceding claims wherein the body portion has a wall portion which, in use, is in thermal connection with the holder portion, that wall portion being substantially in direct contact with the heating means.
7. An evaporator according to claim 6, wherein the

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heating means is mounted on said wall portion.

8. An evaporator according to claim 7, wherein the heating means is coupled to said wall portion by thermally conductive cement.

5 9. An evaporator according to claim 7 or 8, wherein the heating means is mounted on the wall portion by a pair of clips integral with wall portion.

10. An evaporator according to any one of the preceding claims wherein the holder portion comprises a
10 cartridge holder.

11. An evaporator according to claim 10 when appended to claim 6, wherein the cartridge holder has an opening therein to enable a received cartridge to contact said wall portion of the body portion.

15 12. An evaporator according to claim 11 wherein said wall portion projects beyond the surrounding areas of the body portion so as to extend into said opening when the cartridge holder is attached to the body portion.

13. An evaporator according to any one of the
20 preceding claims wherein the heating means is electrically operable.

14. An evaporator according to claim 13 wherein the heating means comprises a resistance.

15. An evaporator according to claim 14, wherein the
25 heating means comprises a resistance in the form of an elongate resistor having its longitudinal axis arranged substantially at right angles to the direction of relative movement between the holder portion and the heating means.

30 16. An evaporator according to claim 14 or 15, wherein the said resistance has a value in the range 33 to 53 k Ω .

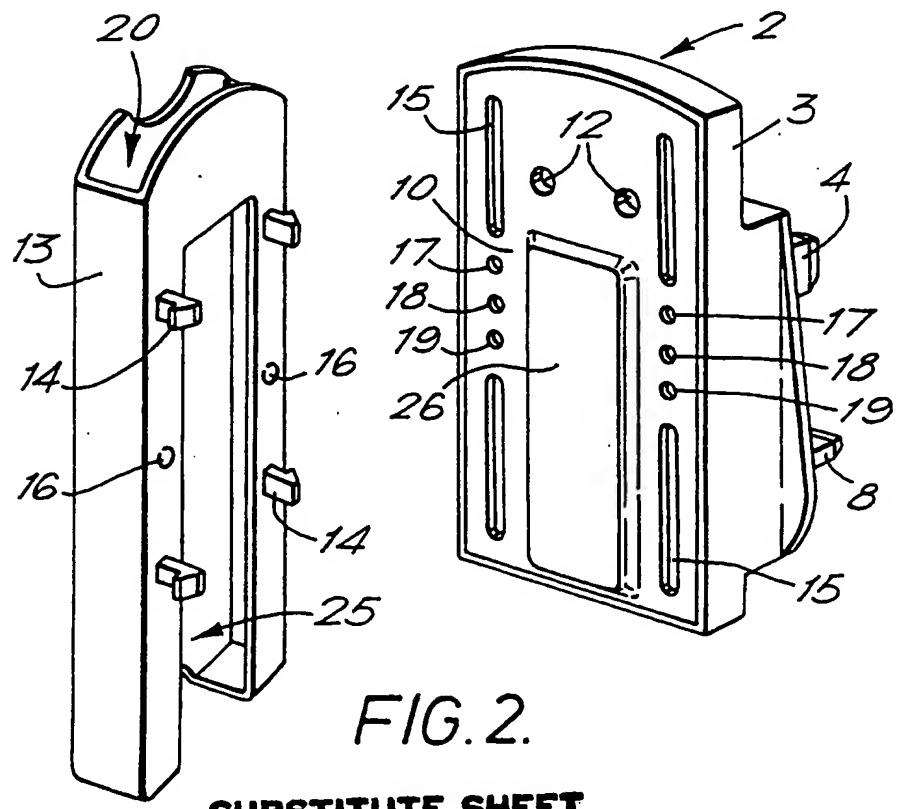
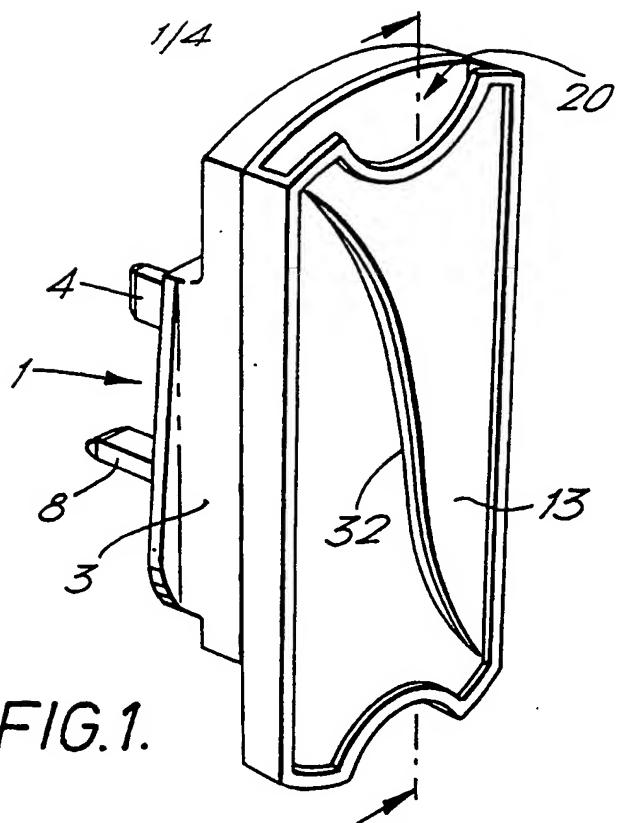
17. An evaporator according to claim 16, wherein the said resistance has a value of approximately 43 k Ω .

35 18. An evaporator according to claims 15, 16 or 17, wherein the body portion comprises projecting plug pins

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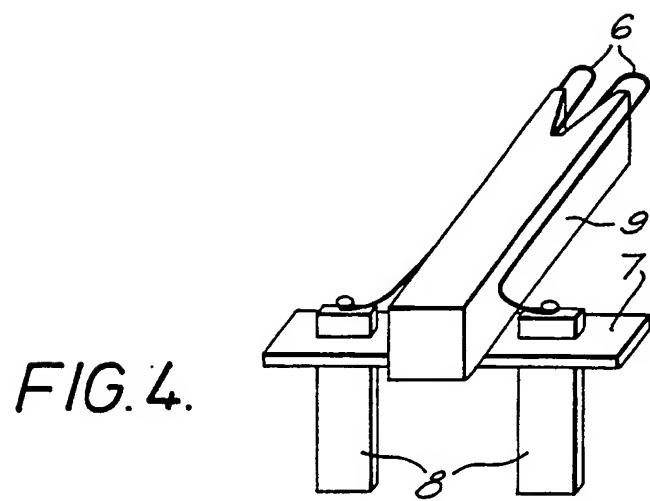
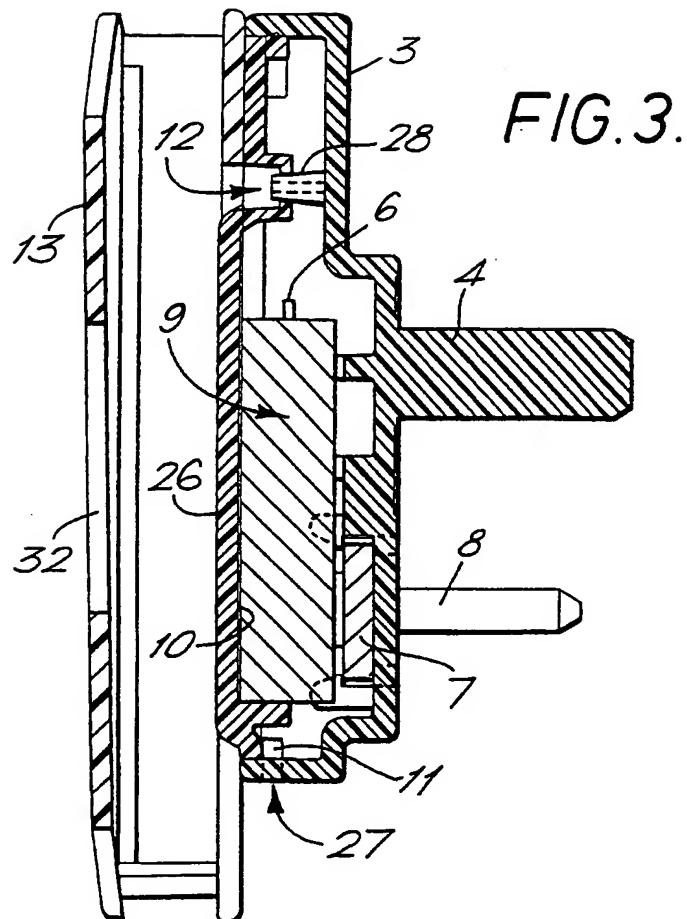
for connection of the body portion to a standard power point to supply electric power to the electric heating means.

19. An evaporator according to any one of the preceding claims in combination with the volatile material in said space, that material being an air-freshening material.
20. An evaporator comprising heating means, locating means for locating a container of volatile material relative to the heating means so that, in use, heat may be transferred from the heating means to the container, and displacement means for effecting relative displacement between the container and the heating means.
- 15 21. An evaporator substantially as hereinbefore described with reference to Figures 1 to 5, or those figures as modified by Figures 6 and 7, of the accompanying drawings.



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**SUBSTITUTE SHEET**

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FIG.5.

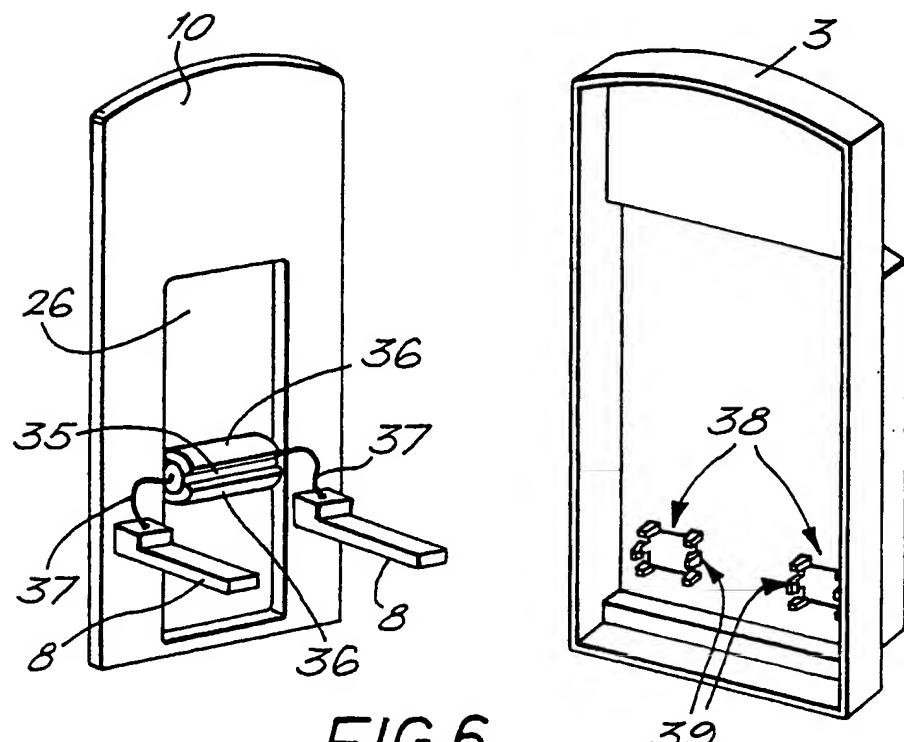
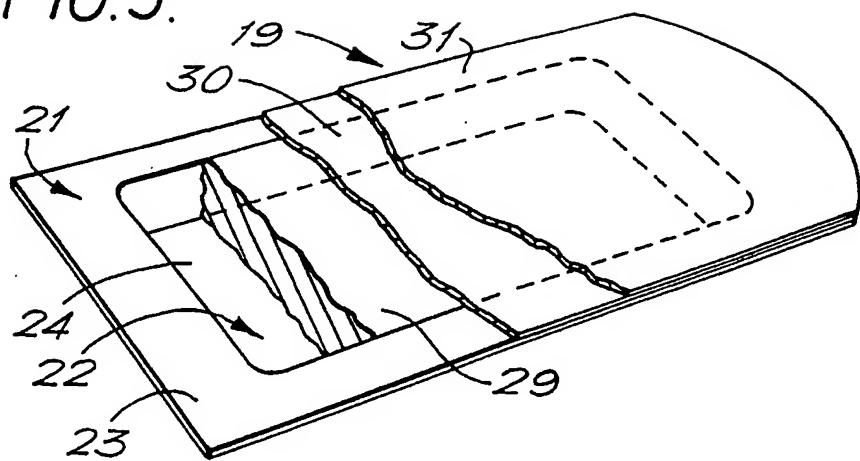


FIG.6.

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FIG.7.

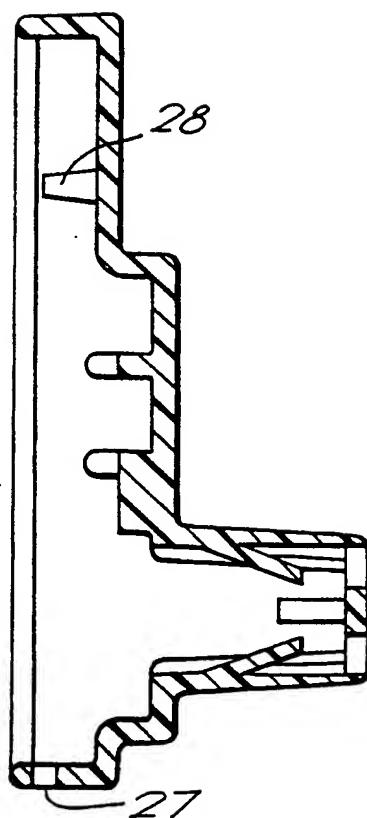
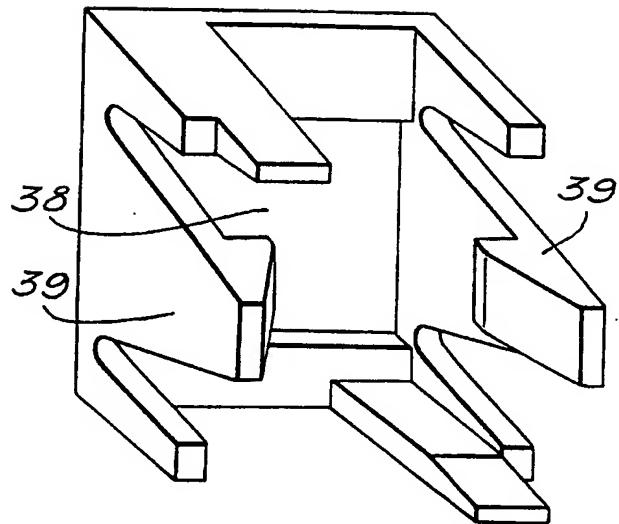


FIG.8.

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INTERNATIONAL SEARCH REPORT

Int. Application No
PCT/GB 94/00052

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A61L9/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 511 853 (VOLEX GROUP PLC) 4 November 1992 see column 1, line 26 - line 30; claims ---	1-21
A	FR,A,2 432 837 (FIRMA GLOBOL-WERK G.M.B.H.) 7 March 1980 ---	
A	EP,A,0 296 807 (ENVIRONMENTAL FRAGRANCE TECHNOLOGIES, LTD) 28 December 1988 -----	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

7 April 1994

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte.	nal Application No
PCT/GB 94/00052	

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		AU-A-	1525092	28-01-93
		CA-A-	2067704	02-11-92
FR-A-2432837	07-03-80	DE-U-	7823826	08-02-79
		NL-A-	7906097	12-02-80
		SE-A-	7906454	11-02-80
EP-A-0296807	28-12-88	US-A-	4804821	14-02-89
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